REMARKS

Claims 1-58 are presently pending in the application. Claims 19-22 and 39-58 remain withdrawn from consideration. Claims 1-10 and 23-30 are generic.

Claim 1 has been amended to recite that the alloy composition consists of Sn, Bi, and In in the recited amounts. Further, claims 3 and 4 have been rewritten in independent form to incorporate subject matter from original claims 1 and 2. Claims 3 and 4 have also been amended to recite that the composition does not intentionally contain an element which is harmful to a living body, which is supported in the present specification at least in paragraph [0004]. No new matter has been added by these amendments, and entry is respectfully requested.

In the present Office Action, the Examiner re-iterates the election of species requirement made orally to William Schwarze on December 8, 2005. Specifically, the Examiner argues that the application contains claims directed to three patentably distinct species: cylindrical case type fuses, thin type fuses, and substrate type fuses, and requires that Applicant select one species for initial examination. The Examiner acknowledges that claims 1-10 and 23-30 are generic. Applicant hereby confirms the provisional election made earlier to prosecute the claims directed to the cylindrical case type fuse, claims 11-18 and 31-38. (It is noted that the Examiner includes only claims 32-38, but claim 31 should be included as well.) Accordingly, claims 19-22 and 39-58 remain withdrawn from consideration.

The Examiner has also rejected claims 1-58 under 35 U.S.C. § 112, second paragraph, as being indefinite with regard to the percentage which is recited. By the present amendment, claims 1, 3 and 4 have been amended to recite that the percentages are weight percentages. Accordingly, reconsideration and withdrawal of the § 112 rejection are respectfully requested.

Additionally, the Examiner has rejected claims 1 and 2 under 35 U.S.C. § 102(b) as being anticipated by JP 2000-141078 ("JP '078") and has rejected claims 1, 3, and 5 under 35 U.S.C. § 103(a) as being unpatentable over JP 11-40025 ("JP '025"). Further, claims 2, 4, and 6 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '025 in view of JP 2001-266724 ("JP '724") and claims 7-10 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '025 in view of JP '724 and further in view of JP 11-306940 ("JP '940"). Finally, claims 11-18 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '025 in view of JP '724, JP '940 and JP 40-3110732 ("JP '732"), and claims 23-38 have been

rejected under 35 U.S.C. § 103(a) as being unpatentable over JP '025 in view of JP '724, JP '940, JP '732 and GB 2028608 ("GB '608"). Applicant respectfully traverses these rejections and the arguments in support thereof as follows, and respectfully requested reconsideration and withdrawal of the rejections.

Rejection Under § 102(b) Based on JP '078

Regarding claims 1 and 2, the Examiner argues that JP '078 teaches a material having an alloy composition containing 59% Sn, 5% Bi and 30% In. In Example 18, JP '078 allegedly teaches that the material further contains 2.5% Ag. The Examiner further argues that the claimed recitation that the material is "for a thermal fuse element" is merely an intended use, and that since the material of JP '078 is allegedly capable of performing the intended use, JP '078 anticipates the present claims. Applicant respectfully traverses this rejection as follows.

Claim 1 recites a material for a thermal fuse element having an alloy composition which consists of only Sn, In and Bi in the specified amounts. As recited in claim 2, 0.1 to 3.5 weight parts of Ag, Au, Cu, Ni, Pd, Pt, Sb, Ga, and/or Ge are added to 100 weight parts of this alloy composition.

JP '078 teaches a lead-free solder containing Al, In, Ag, and Sn, and optionally Cu, Zn, Sb, Ti, Si, and/or Bi. Applicant respectfully traverses the Examiner's unsubstantiated statement that the solder of JP '078 would be capable of functioning as a material for a thermal fuse as claimed. However, even if the amounts of In, Sn, and Bi in the JP '078 solder were to overlap with the claimed amounts, the presently claimed alloy composition of claim 1 is limited to only these three elements by the "consisting of" language, and thus excludes the presence of any other element, including the Al and Ag which must be present in the JP '078 solder. Further, regarding claim 2, only Ag, Au, Cu, Ni, Pd, Pt, Sb, Ga, and/or Ge may be added to the In/Sn/Bi alloy composition, thus excluding any other elements, such as Al and Ag. In Example 18 of JP '078, which is specifically referred to by the Examiner, the composition contains 59% Sn, 0.5% Al, 30% In, 2.5% Ag, 1% Zn and 5% Bi. Due to the presence of Al, Ag, and Zn, this alloy does not anticipate the presently claimed alloy, and JP '078 does not anticipate the present claims.

It is also noted that Al and Zn are elements with a large ionization tendency and low oxidation resistance. Including such elements in an In/Sn/Bi alloy composition results in the formation of a hard oxidation film in a fuse element. Such a hard film makes it difficult for the fuse element to be fused off even if a fusible alloy inside the fuse element is melted. Moreover, when such a fuse element is used, when flux is applied, the progress of an oxidation reaction of

the fuse element is fast, thereby deteriorating the flux and reducing its service life. Therefore, such an alloy composition cannot be used as a fuse element, and thus alloy compositions which are appropriate for use in fuse elements must have high oxidation resistance (and thus cannot contain Al and Zn). In contrast, the objective of JP '078 is to provide a lead-free solder with sufficient joint strength to oxide materials, such as glass and ceramics. Al and Zn are thus desirably included because they are easy to join to oxide materials. The solder of JP '078 would thus not be able to function as a material for a thermal fuse as claimed.

For all of these reasons, JP '078 does not anticipate or render obvious the presently claimed invention, and reconsideration and withdrawal of the § 102(b) rejection are respectfully requested.

Rejections Under § 103(a) Based on JP '025 Alone or in view of JP '724, JP '940, JP '732 and/or GB '608

Regarding claim 1, the Examiner argues that JP '025 teaches a material for a thermal fuse element having an alloy composition containing 35 to 48 weight % Sn, 0.3 to 6 weight % Bi, and 26 to 55 weight % In, which allegedly overlap the claimed ranges. Therefore, the Examiner concludes that it would have been obvious to select the claimed amounts of Sn, Bi, and In from the ranges taught by JP '025 since JP '025 teaches such compositions for the same utility.

Regarding claims 2, 4, and 6, the Examiner acknowledges that JP '025 does not specify adding 0.1 to 3.5 weight parts of Ag to the alloy composition of claim 1, but argues that JP '724 teaches adding such amounts of Ag to a similar fuse thermal fuse composition to lower resistivity, and thus concludes that it would have been obvious to add Ag to the JP '025 material.

Regarding claims 7-10, the Examiner acknowledges that JP '025 does not teach or suggest that at least a portion of the lead conductors would be covered with an Sn or Ag film. However, in view of the alleged teaching of JP '940 of applying a Sn or Ag film to the surface of lead conductors to improve their bonding strength, the Examiner concludes that the claimed invention would have been obvious based on JP '025 in view of JP '940.

Further, concerning claims 11-18, the Examiner acknowledges that the proposed combination of JP '025 with JP '724 and JP '940 does not teach that the ends of the lead conductors have a disk-like shape and that ends of the fuse element are bonded to front faces of the disks. However, JP '732 allegedly teaches providing lead conductors with a disk-like shape at the ends of the lead conductors and bonding the fuse elements to the front faces of the disks in

order to prevent flux from adhering to the ends of the cylindrical case and to achieve quick separation when the fuse is activated. Therefore, the Examiner argues that it would have been obvious to combine these attributes, as taught by JP '732, with the proposed JP '025/JP '724/JP '940 fuse element to arrive at the present invention.

Finally, regarding claims 23-38, the Examiner acknowledges that the cited references do not teach providing a heating element for fusing off the fuse element. However, GB '608 allegedly teaches providing a resistor to blow a thermal fuse in order to terminate heating in a circuit for an electric blanket. Therefore, the Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the JP '025/JP '724/JP '940/JP '732 combination by providing a resistor to blow a thermal fuse to terminate heating in a heating circuit. Applicant respectfully traverses these § 103(a) rejections as follows.

JP '025 teaches an alloy-type thermal fuse using an alloy composition containing 0.3 to 6% Bi, 10 to 18% Cd, 35 to 48% Sn, and remainder (about 26-55 %) In. Cd is included in the alloy, thereby narrowing the solid-liquid coexistence region to 4°C (see paragraph [0014] of JP'025). Additionally, the dispersion of the operating temperature is reduced in the JP '025 thermal fuse by the inclusion of Cd in the alloy.

As previously explained, the presently claimed alloy composition recited in claim 1 is limited to only three elements, Sn, In and Bi, thus excluding any other element from the alloy, including the Cd which is present in the JP '025 material. Further, regarding claim 2, only Ag, Au, Cu, Ni, Pd, Pt, Sb, Ga, and/or Ge may be added to the In/Sn/Bi alloy composition, thus excluding any other elements, such as Cd. Due to the presence of Cd in the JP '025 alloy composition, JP '025, alone or in combination with JP '724, does not render obvious claims 1 and 2. Accordingly, withdrawal of the § 103(a) rejections of claims 1 and 2 are respectfully requested.

Claims 3 and 4 and the claims which depend therefrom recite an alloy type thermal fuse using a particular alloy composition as the material for the fuse element. This alloy composition contains Sn, In and Bi in specified amounts, also does not intentionally contain any element which is harmful to a living body. The thermal fuses according to the invention thus achieve the goal of environmental conservation by protecting both individuals involved in the manufacturing of the thermal fuses and those end-users who handle the fuses. More than 90% of electrical and electronic apparatuses are buried, burned, or recycled, thus releasing contaminants which pollute

the air, water, and soil. Thus, eliminating harmful elements from electrical and electronic devices protects the air, soil, and water supply. Accordingly, elements, such as cadmium, which is known to be harmful to humans by impairing liver function and causing brain damage, are not intentionally included in the claimed materials.

Applicant has discovered an environmentally friendly alloy composition which does not contain Cd or other harmful elements in order to reduce the dispersion of the operating temperature. Rather, in the presently claimed alloy, the solid-liquid coexistence region is widened to be about 73° C. As explained in paragraphs [0007] to [0010] of the present application, by setting a region of the alloy composition of the presently claimed composition which makes a spheroid division occur in the vicinity of the single maximum endothermic peak, dispersion of the operating temperature can be reduced.

In contrast, the alloy composition of JP '025 contains 10-18% Cd in order to reduce the dispersion of the operating temperature. However, JP '025 is not concerned with addressing environmental considerations and thus does not teach or suggest all of the claimed elements. In fact, JP '025 teaches away from the presently claimed invention since Cd is intentionally included in the JP '025 alloy. For these reasons, no *prima facie* case of obviousness has been established based on JP '025.

Finally, regarding the dependent claims, even the proposed combinations of JP '025 with JP '724, JP '940, JP '732 and/or GB '608 would not cure the deficiencies with JP '025. Specifically, none of these references teaches excluding Cd or other elements which would be harmful to a living body. In fact, JP '940 teaches that the alloy composition may contain Pb or Cd, which are both known to be harmful to humans. Rather than curing the deficiencies with JP '025, each of the secondary references is cited by the Examiner for teaching structural features (such as a heating element or a Sn or Ag film) which the Examiner acknowledges are not taught or suggested by JP '025. Therefore, even if any of the proposed combinations of JP '025 with JP '724, JP '940, JP '732 and/or GB '608 were proper, the combinations would not result in the presently claimed invention.

For all of these reasons, reconsideration and withdrawal of the § 103(a) rejections based on JP '025 alone or in view of JP '724, JP '940, JP '732 and/or GB '608 are respectfully requested.

In view of preceding Amendments and Remarks, it is respectfully submitted that the present claims are in full compliance with § 112, patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

YOSHIAKI TANAKA

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(Date)

SANDRA M. KATZ
Registration No. 51,864
AKIN GUMP STRAUSS HAUER & FELD LLP
One Commerce Square
2005 Market Street, Suite 2200
Philadelphia, PA 19103-7013
Telephone: 215-965-1200
Direct Dial: 215-965-1344
Facsimile: 215-965-1210
E-Mail: skatz@akingump.com

WWS/SMK:rc